

DRAFT

GROUND WATER ASSESSMENT WORKPLAN

SITE 10

Lake Jesup Watershed, Sanford Florida

May 2, 2007

*Prepared by the Ground Water Protection Section, Bureau of Watershed Management,
Florida Department of Environmental Protection*

This work plan was developed to document site assessment and reporting activities proposed by the Florida Department of Environmental Protection (DEP) Ground Water Protection Section for conducting an evaluation of the shallow ground water conditions at the Site 10 wastewater residuals and reclaimed wastewater application site operated by the City of Sanford. The purpose of this assessment is to ground truth existing nutrient levels in shallow ground water in application areas that drain to Lake Jesup and provide current information to be used in calculating loadings of nitrogen and phosphorus to the lake. This information will be used in the reevaluation of nutrient loading from Site 10 as part of the Lake Jesup Basin Management Action Plan (B-MAP).

Background

In a recent report by Camp Dresser McKee (Danielle Honour, P. E., February 27, 2007 memorandum to Paul Moore of the City of Sanford), CDM provided a data evaluation and simple ground water transport model to obtain an estimate of the ground water loading of nitrate from the site to the lake. While the approach taken has merit and was a good effort based on available ground water quality data, the ground water monitoring wells available for the study were not properly located to provide ground water quality and elevation data representative of the residuals/reclaimed water application areas near the lake. These wells were installed for regulatory monitoring years before the recent CDM Site 10 analysis was conducted. Only 2 of the 13 monitoring wells available for the CDM evaluation appear to be located in areas that drain to the lake and these two wells provide results for only the northern edge of the site (per Figures 9 and 16 from the CDM memo, which are attached). Ground water quality and gradient data from the areas that drain to the lake can then be used to calibrate and, if necessary, update the CDM model.

Proposed Scope of Supplemental Monitoring

This project includes collection of ground water samples representative of application areas in Site 10 sub-basins S10-003, S10-006, S10-008 and S10-010

(see Figure 9 from CDM memo). These are un-monitored sub-basins containing fields that are located adjacent to the lake. These fields have been used for both application of treated wastewater and residuals. In addition, information on ground water elevations relative to the lake stage is needed to establish the ground water flow gradient across the portion of Site 10 that drains to the lake. The combination of ground water quality and flow gradient data will allow refinement of current Site 10 nutrient loading estimates. It is anticipated that in-house resources can be made available to conduct this mini-assessment and that it can be conducted in only a few days. The proposed field activities would include installation of temporary wells, ground water sampling, an elevation survey and water level measurements. These are described in greater detail below.

Temporary Well Installation

It is anticipated that approximately 8 to 10 shallow temporary monitoring wells would be installed to provide ground water quality data representative of the sub-basins that do not have ground water monitoring data and to provide adequate spacing between wells to measure a ground water flow gradient. These small-diameter "micro" wells will be installed at the edge of application sites using a direct-push rig owned by the DEP. Under typical conditions, the water table is less than 5 feet below land surface, but exact well depths will be determined in the field. Depths of the temporary wells are anticipated to be approximately 10 feet below the water table at each site.

Ground Water Sampling

Each of the temporary wells will be sampled by certified staff in accordance with DEP sampling standard operating procedures. These will be analyzed at the DEP Central Laboratory. The following parameters will be analyzed by the lab or measured in the field:

nitrate+nitrite nitrogen, dissolved, lab

ammonia nitrogen, dissolved, lab

phosphorus, dissolved, lab

pH, field

specific conductance, field

temperature, field

dissolved oxygen, field

Surface Water Sampling

Surface water locations along the edge of Lake Jesup will also be monitored for the same parameters shown above. One to two sampling sites will be selected for each of the temporary wells. Locations of the surface water sampling sites will correspond with locations of the temporary wells and may be taken from

open lake water or within the fringe marsh. The surface water samples will also be collected by certified staff in accordance with DEP sampling standard operating procedures. These will be analyzed at the DEP Central Laboratory.

Elevation Survey and Water Level Measurement

An elevation survey will be conducted using standard leveling techniques to tie in top-of-casing elevations of the temporary wells with a common onsite bench mark, hopefully of known elevation. One or more temporary staff gauges will also be installed at nearby points on Lake Jesup and tied in to the survey. Water levels will then be measured and converted to elevations to assist in establishing the ground water flow gradient, which is important for estimating rate of flow and loading to the lake. Water levels will be measured at least twice during this assessment. Well and gauge locations will be established using global positioning system equipment.

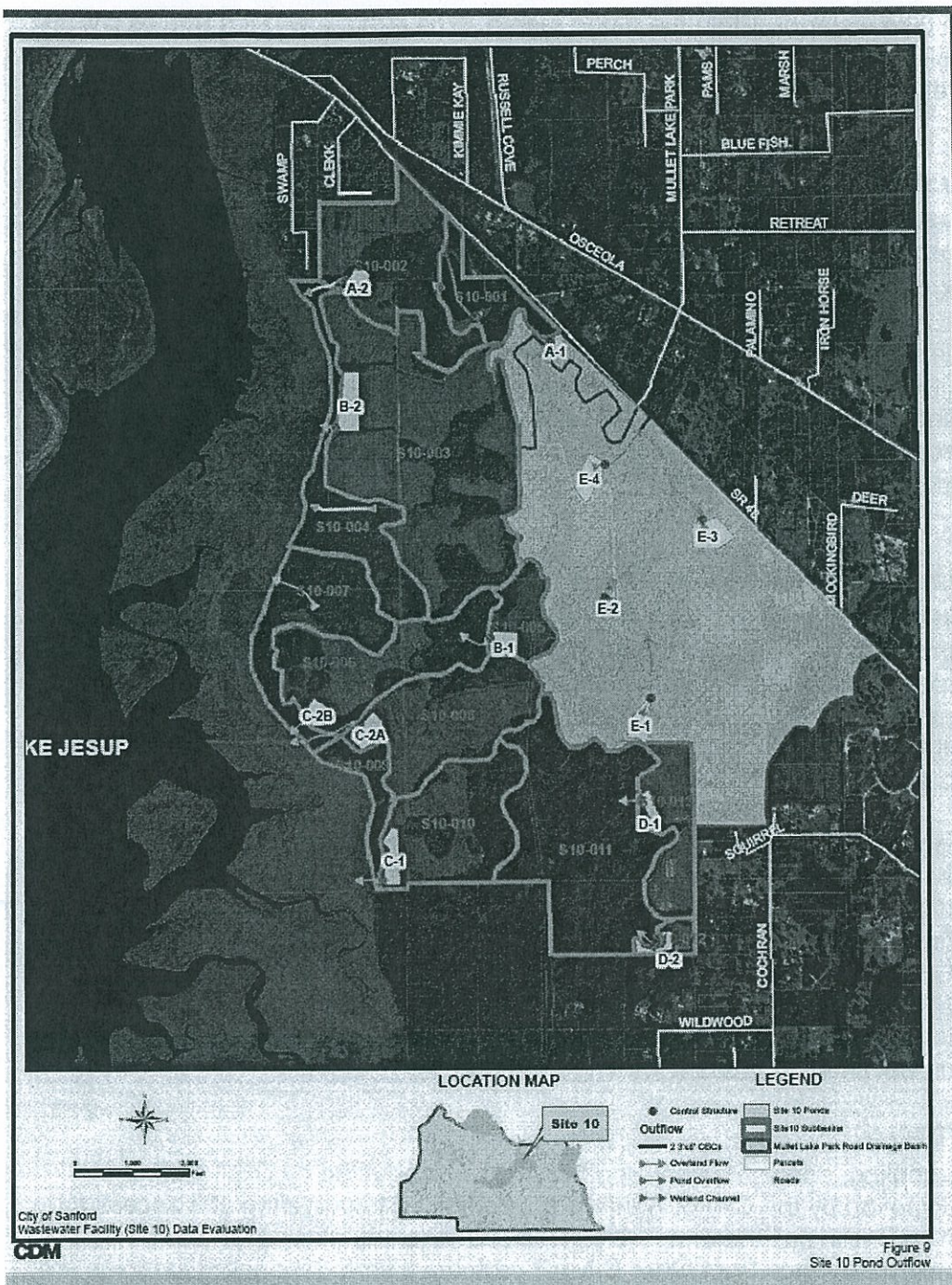
Data Analysis and Report

Upon completion of the sampling and analysis, a report will be prepared that summarizes the results of the study. A second document will then be prepared that provides refined estimates of nutrient loading to Lake Jesup that is due to the activities on Site 10. This data will be provided in the context of both the assumptions made during development of the Lake Jesup Total Maximum Daily Load study as well as the more recent CDM report.

It is anticipated that the water quality analysis report will be received from the laboratory within one month of sampling. Reduction of the water level data, creation of maps and tables and development and review of a summary report on the findings is anticipated to take an additional month. This will be shared with the City of Sanford and the B-MAP working group prior to any additional modeling or data reduction to refine ground water loading calculations. The B-MAP working group will then have this information at their disposal to consider when reevaluating nutrient loading from Site 10.

Partners

All sampling, analyses, and reporting will be conducted by DEP staff. Participation by the City of Sanford will be limited to providing site access for DEP staff to install the temporary wells and take samples. DEP staff may request assistance from other B-MAP partners if time-dependent samples are needed. However, participation will be at their discretion, depending on staff availability.



CDM Memo, Figure 9

DRAFT FOR DISCUSSION

Lake Jesup - Key Facts, Knowledge Gaps, and Current Research

Issue	Key Facts - Consensus	Key Unknowns	Completed Studies		Pending Studies	
Sediment Flux	- Nutrient flux occurs between the water column and lake sediments. - Sed. flux needs to be carefully considered when evaluating loads to the water column. - Without more information, our ability to predict in-lake benefits of external load reductions is limited	- Variability in flux rates and loading from sediment to water column - Magnitude relative to external loading - Dynamics over time and under changing conditions - Ability to predict change with future loading reductions	Seminole County (PBS&J; HydrO2) - Project report available.	Description - In situ measurements of sediment nutrient flux and SOD - 5 sites - One sampling visit per site Findings - "Considerable net gain of NH3 and dissolved phosphorus to the waters of Lake Jesup from the lake bed." (6877-15,675 lbs/day for ammonia; 553-722 lbs/day dissolved phos) - "Lake bed is a considerable source of nutrients to the waters of Lake Jesup"	SJRWMD - RFP pending - Work should be completed in about 5 months.	Description - Comparison of 3-4 different methods for measuring sediment flux.
Nitrogen Fixation	- N-fixation is a source of nitrogen in Jesup. - Amount of N-fixing phytoplankton should decrease with lower external nutrient loading - Traditional loading models (i.e. TMDL model) have not been able to account for the high in-lake TN concentrations	- Rate of N-fixation specific to Jesup (used Lake George rates in the TMDL) - Magnitude relative to external loading	Seminole County Study (PBS&J)	Description - 10 sites sampled on 8/29/2006 Findings - Average rate equals 45% of the TN load (1995-2002) - TN load from N-fixation (45% of total); roughly twice that the proportion from stormwater runoff (23%)	SJRWMD - In progress - Interim report due summer 2007; work should be completed by end of 2007	Description - Annual nitrogen loading from N-fixation. Temporal and seasonal variability & range. - Measure annual nitrogen loading from nitrogen fixation - Determine temporal and spatial variability in nitrogen fixation within each lake

	- Variability between middle basin lakes		TMDL (DEP & PBS&J)	- N-fixation estimated with rates from Lake George - Calculated to account for difference in nitrogen loading from external sources relative to in-lake concentrations. - N-fixation could be responsible for approx. 45% of the Jesup N load		- Determine ambient range of nitrogen fixation - Identify environmental conditions that contribute to high populations of N-fixing phytoplankton
Watershed Nutrient Loading	Rough agreement on the overall nutrient loading, as well as relative proportions contributed by different land use types	N loading from Site 10 wastewater and residuals application	TMDL (DEP & PBS&J)	- TN (500 MT/yr) & TP (28 MT/yr) loading estimates - Watershed loading by land use, jurisdiction, and subbasin - Estimated BMP reductions	SJRWMD PLRG	Initial loading calculations completed (TN=140.7 MT/yr; TP=18.7 MT/yr). These represent surface, baseflow, and septic tanks.
			CDM Site 10 Analysis	Revised TN & TP loading estimates, including stormwater, residuals, and wastewater application	DEP Site 10 Groundwater Assessment - Scope approval pending - Should be completed within 3 months	- Temporary well installation and sampling - Refined estimate of nutrient loading from activities at Site 10
Phosphorus-Chlorophyll Relationship	Reductions in watershed phosphorus loading are expected to decrease chlorophyll/TSI	Degree to which reductions in water column phosphorus will trigger reductions in chlorophyll		Some evidence from historic removal of WWTP's in Jesup		
Others?						